

CHAPTER 3

DATA COLLECTION PACKAGE

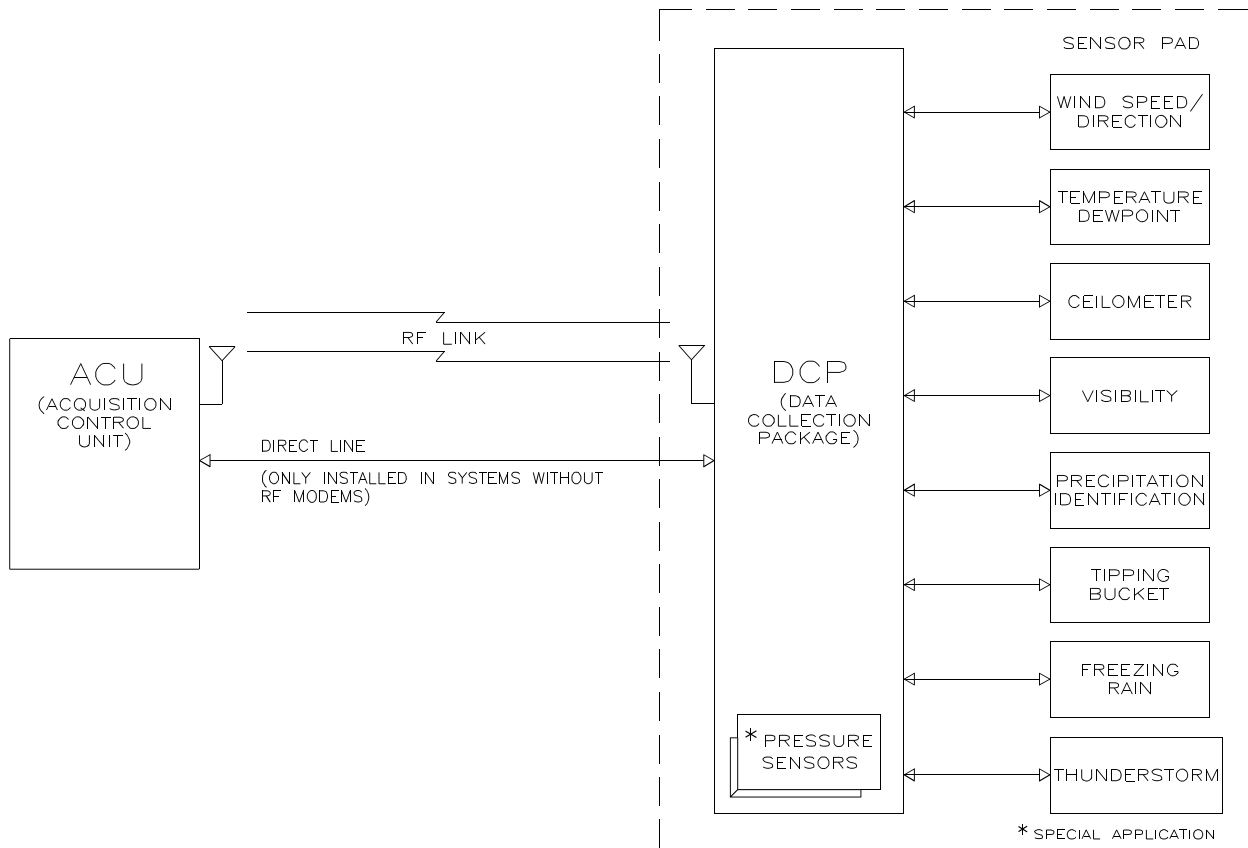
SECTION I. DESCRIPTION AND LEADING PARTICULARS

3.1.1 INTRODUCTION

Each ASOS may have up to three data collection packages (DCP's) and their sensor complements. The DCP's are designated Unit 2, Unit 3, and Unit 4. This section defines the purpose of the DCP and describes its physical configuration. Locational illustrations are provided to identify DCP assemblies and subassemblies applicable to maintenance personnel.

3.1.2 PURPOSE

An Automated Surface Observing System (ASOS) typically utilizes between one and three remotely located (i.e., outside) DCP's, which function as data links between ASOS sensors and the acquisition control unit (ACU). As illustrated on figure 3.1.1, data exchanges between the DCP and externally mounted sensors are accomplished via fiberoptic cabling, while data transfers between the DCP and ACU are accomplished via radio frequency (rf) communication. However, the system can be configured for hardwire communications between the ACU and DCP. A single DCP may handle data exchanges for up to 16 sensors.



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Figure 3.1.1. DCP Communications Link - Simplified

3.1.2.1 **Class I and Class II Systems.** Throughout this chapter and Chapter 2, a distinction is made between Class I systems and Class II systems. The Class I DCP is the basic model DCP. This model will be installed at most Class I (non-towered) airports and other observation sites. The Class II DCP is very similar to the Class I system, except that the Class II DCP has several additional features to increase system availability and performance. These additional features are identified as follows:

- a. There are two types of uninterruptible power supplies that may be installed in the DCP: UPS 62828-90057, which is installed in serial number 438 and below, and UPS 62828-90338-10, which is installed in serial numbers 439 and above. The UPS allows the DCP to operate in the event of a loss of facility power.
- b. Redundant communications equipment for ACU/DCP data communications. This includes a second CPU and a second rf modem (or line driver) in the DCP.
- c. Electromagnetic interference (EMI) shielded DCP equipment cabinet.
- d. UPS bypass circuit for additional power monitoring and control capability.
- e. At designated sites that have pressure sensors mounted in the DCP, a third (redundant) pressure sensor is added. The third sensor allows ASOS to continue to report altimeter settings and pressure data when one of the three pressure sensors fails.

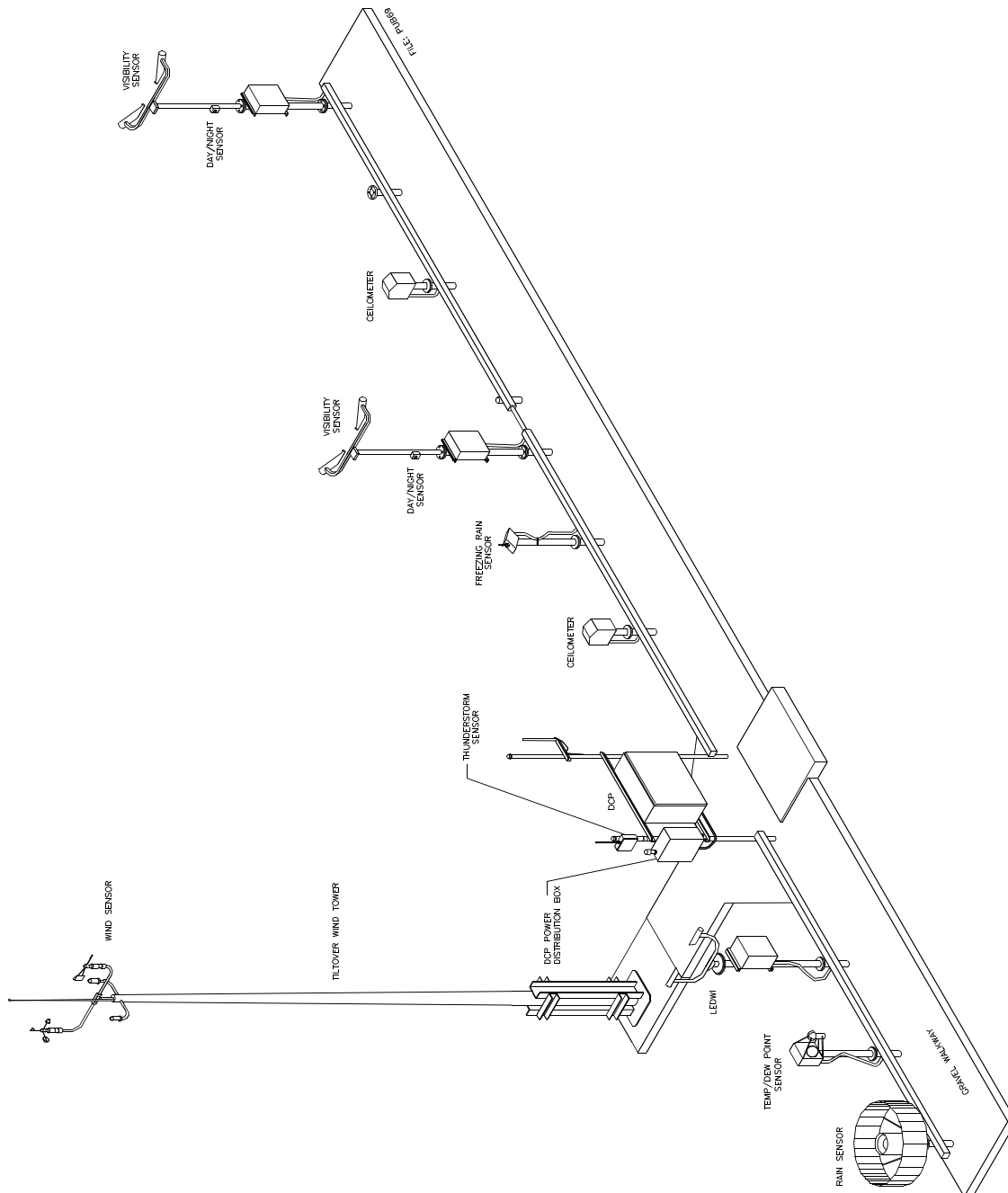
Although the above-mentioned features are standard for Class II DCP's, they are also available as options for Class I DCP's.

§ 3.1.2.2 **Optional Auxiliary Box.** Because of lack of space within the 62928-40070-20 Class I DCP cabinet, an auxilliary box is used to house the optional UPS. The auxiliary box is mounted behind the main DCP cabinet. Also, if more than nine sensors are connected to a Class II DCP, a second UPS is required to provide the back-up ac power for sensors 10 through 17. This second UPS will be mounted in an auxiliary box. Refer to chapter 14 for descriptions and troubleshooting of the auxiliary box.

3.1.3 PHYSICAL DESCRIPTION

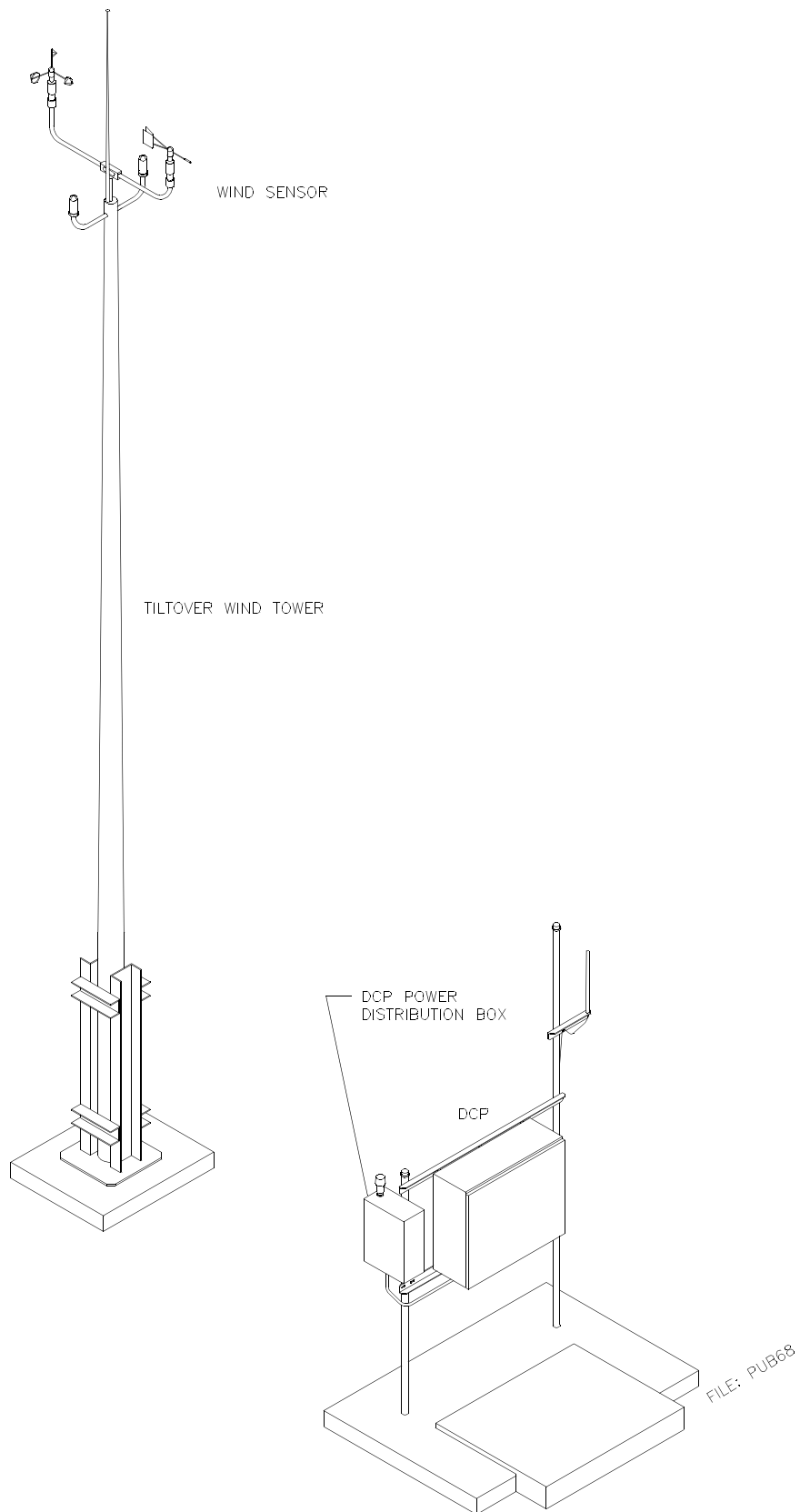
Figure 3.1.2 illustrates three types of DCP installations; combined sensor group (shown with backup sensors), touchdown zone pad, and remote wind sensor pad. Each type consists of the following major units: the DCP equipment cabinet, an externally mounted ac junction box, and an rf antenna. For a Class II installation having more than nine sensors, an auxiliary DCP equipment cabinet housing a second UPS can be added to meet sensor power requirements.

§ 3.1.3.1 **DCP Equipment Cabinet, Unit 2, 3, or 4.** Figure 3.1.3 illustrates a typical Class II DCP equipment cabinet. The Class I DCP equipment cabinet is similar but does not contain the UPS components, UPS bypass circuit, or the backup battery box. The Class II DCP contains one of three types of UPS. A SOLA UPS 62828-90057 is installed in serial numbers 438 and below and has components that are behind a UPS cover (sheet 1). Either of two interchangeable Deltek UPS's, 62828-90338-10 or 62828-90338-20 is installed in serial numbers 439 and above; their components are installed inside the UPS box and cannot be removed (sheet 2). In addition to the UPS components and the battery box, the DCP equipment cabinet also contains a card rack assembly, a circuit breaker module rack, an rf modem mounting plate, four dc power supplies, power reset relay, and a Faraday box. At selected sites, the DCP also contains pressure sensors. Many of these assemblies are mounted on, and identified with, a large mounting plate assembly (A1). The Faraday box contains two distribution strips/buses, interconnecting electrical and fiberoptic cabling, and electromagnetic interference (EMI) filters. Brief descriptions of the DCP assemblies are provided in table 3.1.1. Additional information for selected DCP assemblies is provided in the following paragraphs.



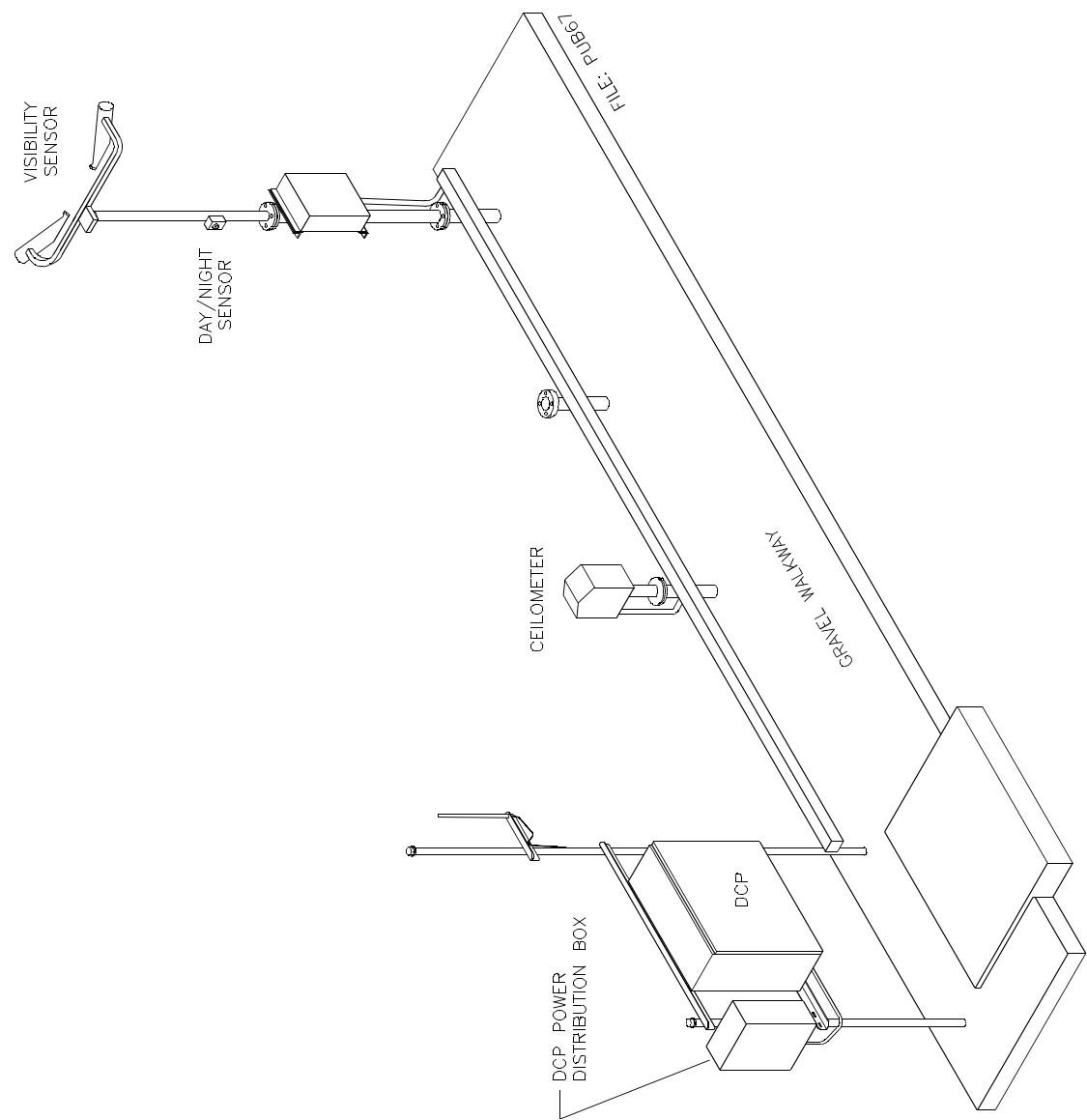
Combined Sensor Group (With Backup Sensors)

Figure 3.1.2. DCP Installation (Sheet 1 of 3)



Remote Wind Sensor Pad

Figure 3.1.2. DCP Installation (Sheet 2)



Touchdown Zone Pad

Figure 3.1.2. DCP Installation (Sheet 3)

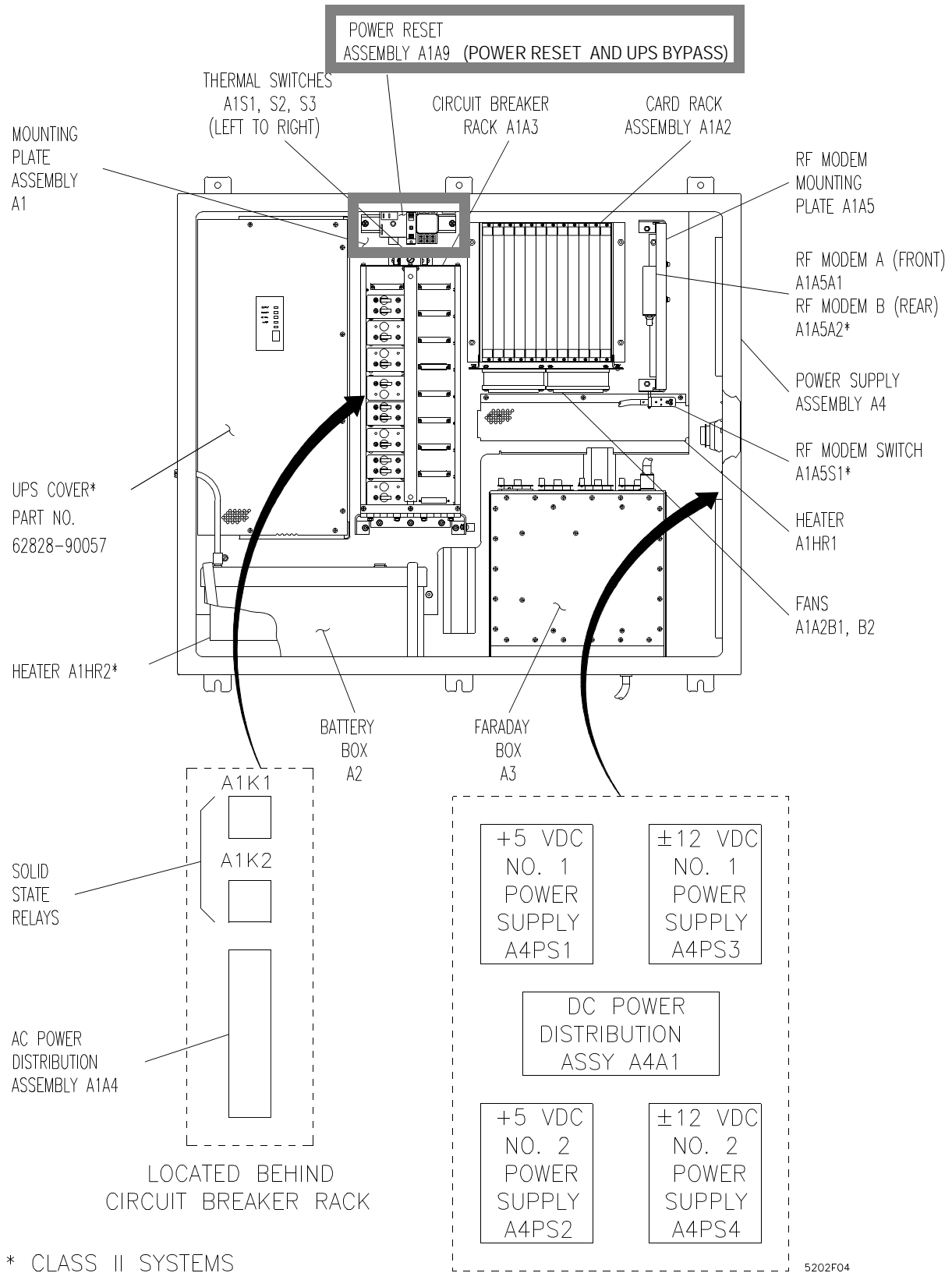
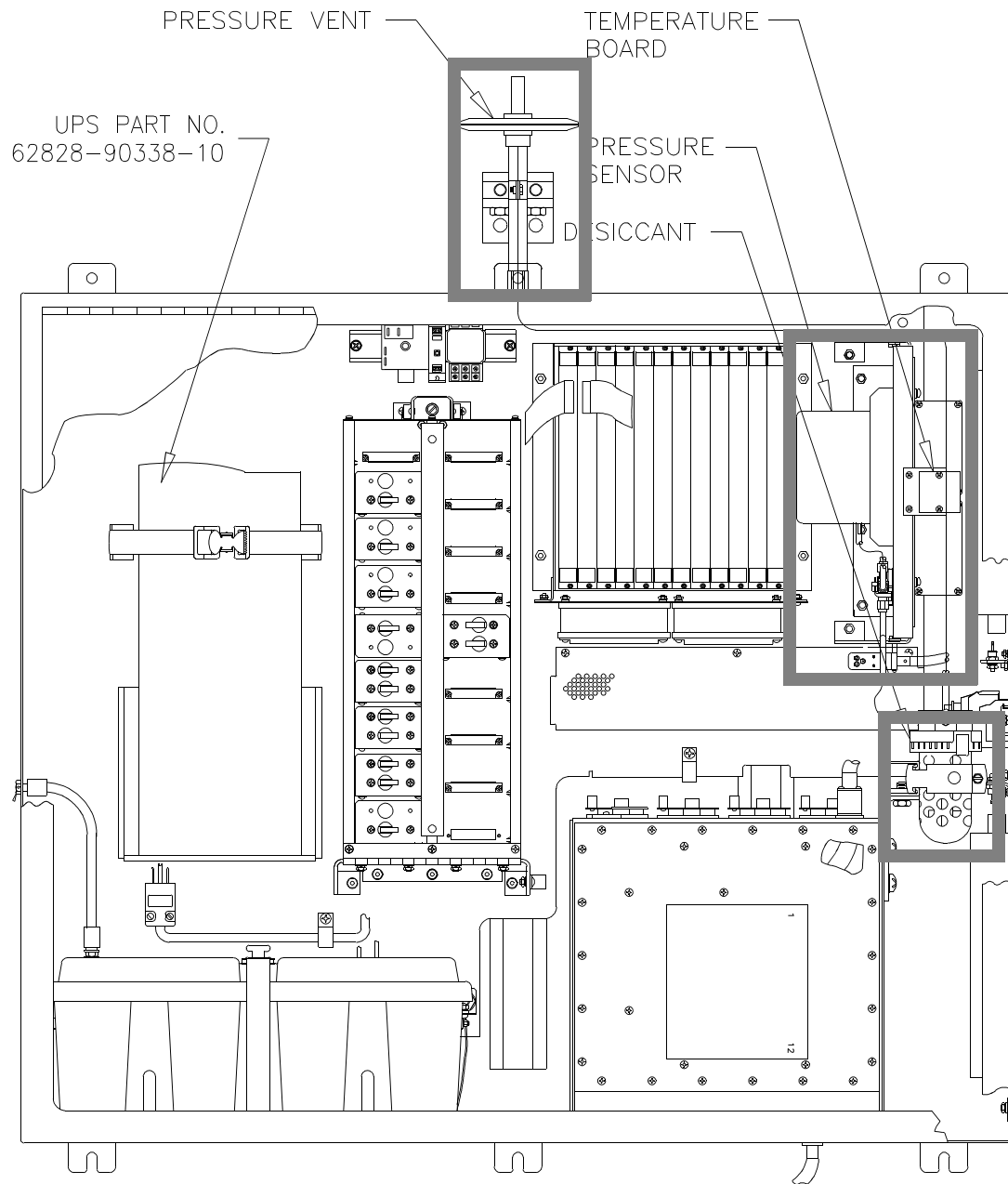


Figure 3.1.3. DCP Equipment Cabinet - Locational View (Sheet 1 of 2)



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Figure 3.1.3. DCP Equipment Cabinet - Locational View (Sheet 2)

Table 3.1.1. DCP Equipment Cabinet Major Assemblies

Unit	Nomenclature	Purpose
A1	Mounting Plate Assembly	Main mounting plate in DCP equipment cabinet.
A1A2	Card Rack Assembly	Contains up to 12 circuit boards that perform all data processing and I/O functions associated with the DCP.
A1A3	Circuit Breaker Rack	Hinged rack assembly containing up to 18 circuit breaker modules. Left row modules (A1 through A9) are allocated for DCP and first eight sensors. Right row modules (A10 through A18) are allocated for optional auxiliary DCP (if Class II system) and sensors 9 through 16.
A1A4	AC Power Distribution Assembly	A terminal strip/bus that distributes ac power (facility or UPS) to DCP assemblies and associated sensors.
A1A5	RF Modem Mounting Plate	For Class II system with rf communication link to ACU, contains rf modem A (A1A5A1), rf modem B (A1A5A2), and an rf modem switch (A1A5S1). For Class I rf link system, contains only rf modem A. For Class II system with line driver link to ACU, contains line driver A (A1A5A1), line driver B (A1A5A2), and an LD1/LD2 switching board (A1A5A3). For Class I line driver system, contains only line driver A. Only on Class I Antarctica systems and selected sites, contains two pressure sensors (A1A5A3 and A1A5A4), third sensor added for Class II systems (A1A5A5).
	UPS cover	Contains UPS status panel and shields individual UPS assemblies (refer to figure 3.1.6 sheet 1). UPS 62828-90057 is installed in serial numbers 438 and below. DCP UPS is installed in Class II systems.
A1A6	UPS	Uninterruptible power supply part numbers 62828-90057, 62828-90338-10, or 62828-90338-20 provide backup ac power.
A1A9	Power Reset Assembly	Contains power delay relay K1 and Class II systems UPS Bypass relays K2 and K3.
A1HR1, HR2	Heater assemblies	Two heater assemblies provide heating for the DCP equipment cabinet. Heater HR1 is mounted below the card rack assembly and contains two 375-watt metal bar elements. HR2 is a 350-watt silicon strip heater element that is mounted behind the battery box in a Class II system. Heater HR2 is not installed in Class I systems.
A2	Battery Box	Contains either four or five 12-volt batteries for UPS. Battery Box A2 may be one of three different assemblies. Part number 62828-40062-10 contains five batteries and is used with SOLA UPS 62828-90057 in DCP serial numbers 438 and below. Part number 62828-40062-30, referred to as the interim battery box, contains four batteries and packing material and is used with Deltek UPS 62828-90038-10 or 62828-90338-20 in DCP serial numbers 439 and above. Part number 62828-90360-10, referred to as the production model battery box, is similar to 62828-40063-30 but is physically smaller. It contains four batteries and is also used with Deltek UPS 62828-90038-10 or 62828-90338-20 in DCP serial numbers 439 and above.
A1S1-S3	Thermal switches	Control activation of DCP heater elements.
A1K1, K2	Solid state relays	Used in conjunction with thermostats to control cabinet heater operation.
A3	Faraday Box	Central signal/power distribution point for DCP associated circuitry. Power, rf signals, and sensor fiberoptics are routed through this box.
A4	Power Supply Assembly	Mounting plate that physically holds dc power supplies and dc power distribution assembly to DCP equipment cabinet.
A4PS1,PS2	5 vdc power supplies	Source of +5 vdc power for DCP cabinet.
A4PS3,PS4	±12 vdc power supplies	Source of ±12 vdc power for DCP cabinet.
A4A1	DC power	A terminal strip/bus that distributes dc power to circuitry within the DCP equipment cabinet.

3.1.3.1.1 Card Rack Assembly A1A2. The 12-slot card rack assembly provides system interconnection for up to 12 circuit board assemblies. These circuit board assemblies provide data processing and input/output (I/O) functions for the DCP. Figure 3.1.4 identifies the specific boards located in each position of the rack. CPU B is installed in Class II systems only to provide a redundant processor in the event that there is a failure in CPU A or its associated ACU communications link. All DCP's contain at least one serial I/O (SIO) board (SIO #1), but up to four additional SIO's may be installed, depending on the number of sensors supported by the DCP. Similarly, all DCP's contain at least one analog to digital converter board (A/D board #1), but A/D board #2 is added when the DCP supports more than eight sensors.

3.1.3.1.2 Circuit Breaker Rack 1A1A3. Circuit breaker rack 1A1A3 (Figure 3.1.5) contains up to 18 circuit breaker modules that control power application to the DCP, DCP sensors (16 maximum), and the optional auxiliary DCP. Circuit Breaker Module A1 is the primary module. It applies power to the UPS (Class II DCP) or DCP electronics (Class I) and to the first group of eight sensors associated with it. Circuit breaker A10 is optional. It applies power to an optional second UPS and to a second group of sensors that may be connected to the DCP. Primary Circuit Breaker Modules A1 and A10 are not field replaceable units (FRU's) themselves. Rather, the individual circuit breakers on these modules are the FRU's. Each module installed in slots A2 through A9 and A11 through A18 is dedicated to one of the installed sensors and applies power to that sensor. These sensor-dedicated modules are FRU's, and their piece parts (circuit breakers, module board) are not. These modules are equipped with relays that permit software control of power to the sensor electronics. The modules installed in slots A2 through A9 and A11 through A18 may contain any of the module models. The model installed in a given slot is determined by the type of sensor that the module is controlling. Each of the models is defined by a different dash number appended to its basic part number. All of the modules have at least one circuit breaker for the corresponding sensor electronics and heaters. Several of the modules provide a second breaker for the sensor's heater circuits. This heater breaker provides a separate run for sensors with high power heaters. The circuit breaker module models are identified as shown in table 3.1.2.

Table 3.1.2. DCP Circuit Breakers

Sensor Type	Dash Number	Heater Breaker
Ceilometer (CHI)	-10	Yes (obsolete, replaced with -80)
Temperature/dewpoint (T/D)	-20	No
Visibility	-30	No
Wind	-40	No
Light emitting diode weather indication (LEDWI) (present weather indicator)	-50	Yes
Tipping bucket (no power)	-60	Heater only
Freezing rain	-70	Yes (obsolete, replaced with -90)
Ceilometer (CHI)	-80	Yes
Freezing rain	-90	Yes
Thunderstorm	-100	Yes

3.1.3.1.3 DCP Uninterruptible Power Supply (UPS). For Class II systems, there are three types of uninterruptible power supplies that may be installed. SOLA UPS 62828-90057 is installed in DCP's with serial numbers 438 and below. Either Deltek UPS 62828-90338-10 or 62828-90338-20 is installed in DCP's with serial numbers 439 and above. A UPS is included in the DCP to provide a backup ac power source for the DCP and up to nine sensors. If more than nine sensors are associated with a Class II DCP, a secondary UPS is installed in an optional auxiliary box. The UPS generates its ac backup power from the dc power provided by Battery Box A2. UPS 62828-90057 is not a unit in itself but is a collection of seven FRU's mounted on Mounting Plate Assembly A1 and the UPS cover. These FRU's are illustrated and identified on figure 3.1.6. UPS 62828-40338-10 is an FRU that is mounted on Mounting Plate Assembly A1.

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§ 3.1.3.1.3a **Power Reset Assembly.** Power Reset Assembly A1A9 (Class I and Class II systems) is located
 § in the top center of the cabinet, above the circuit breaker rack. The power reset assembly consists of Time
 § Delay Relay A1A9K1. The time delay relay ensures that the DCP resets properly after power is interrupted
 § by delaying power application approximately three seconds.

§ 3.1.3.1.3b **UPS Bypass Circuit.** The UPS bypass circuit (Class II systems) is co-located with the Power
 § Reset Assembly A1A9 in the top center of the cabinet. The UPS bypass circuit consists of Digital I/O
 § Module A1A9K2 and Power Relay A1A9K3. The ASOS application software monitors and controls the
 § power relay which routes site power or UPS output power to the cabinet.

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
CPU BOARD A	XVME-601/6										
CPU BOARD B	XVME-601/6*										
MEMORY BOARD		XVME-100/1									
SIO BOARD 1		XVME-490/1									
SIO BOARD 2		XVME-490/1**									
SIO BOARD 3		XVME-490/1**									
SIO BOARD 4		XVME-490/1**									
SIO BOARD 5		XVME-490/1**									
A/D BOARD 1		XVME-590/1									
VME RESISTOR BOARD		62828-47003-20									
A/D BOARD 2		XVME-590/1**									
DIGITAL I/O BOARD		XVME-290/1									

*CLASS II SYSTEMS

**OPTIONAL, DEPENDING ON NUMBER OF SENSORS INSTALLED

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Figure 3.1.4. VME Card Rack - Stuffing Chart

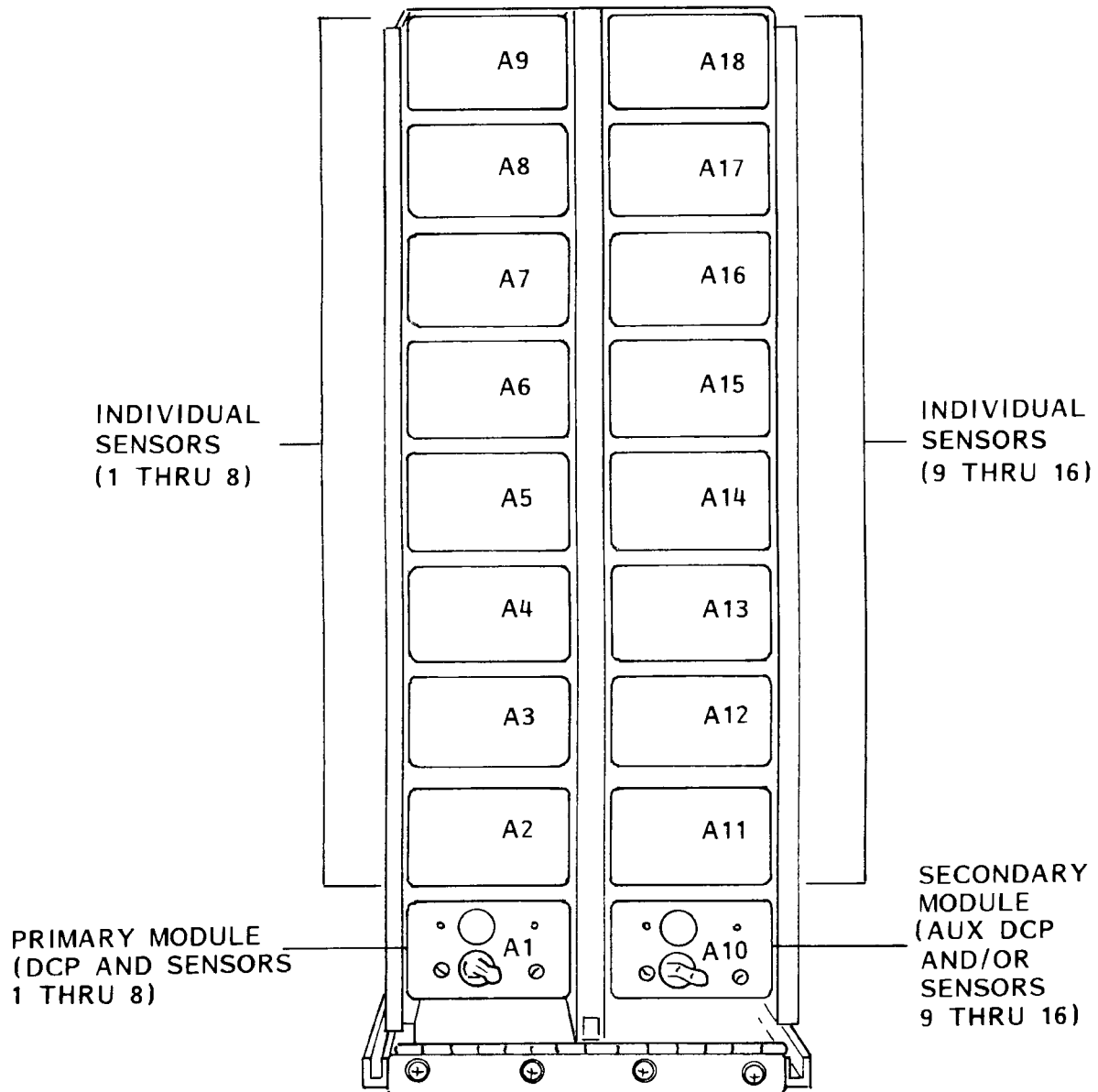
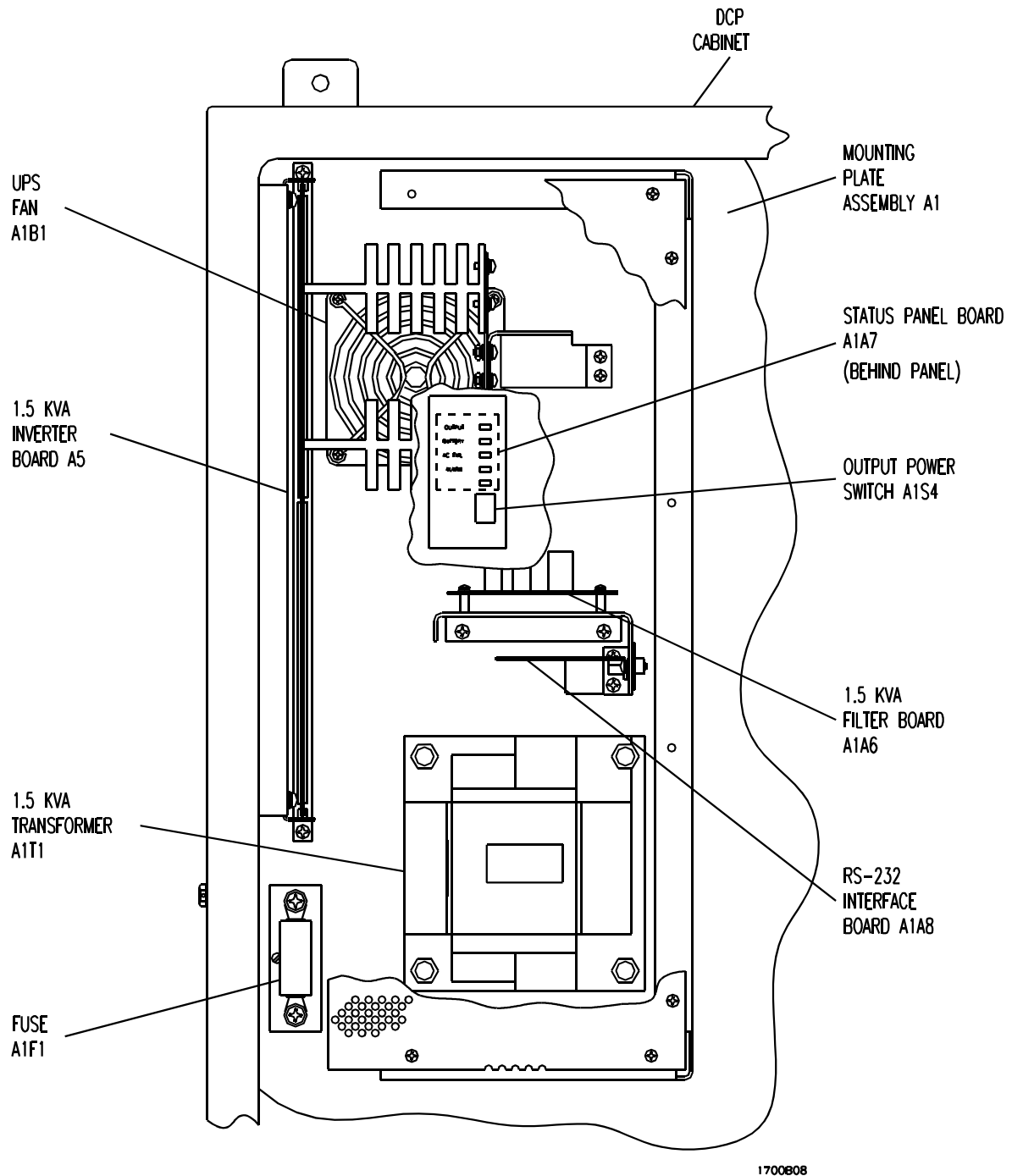


Figure 3.1.5. Circuit Breaker Module Rack - Stuffing Chart



NOTES:

1. COVER REMOVED FOR CLARITY.
2. DCP UPS COMPONENTS INSTALLED ON CLASS II SYSTEMS.

Figure 3.1.6. DCP Uninterruptible Power Supply - Locational View

3.1.3.1.4 DCP Heaters. Heater A1HR1 is installed in both Class I and Class II systems. It contains two 375-watt heater elements for a combined total of 750 watts. For a Class II system, HR2 is also installed to provide heating for the battery box and the UPS components. HR2 is a 350-watt element. Three thermal switches (A1S1 through S3) are used in conjunction with two solid state relays (A1K1 and K2) to control the heaters. Power is applied to one element of HR1 and to HR2 (if installed) as the internal DCP temperature drops below 50 degrees Fahrenheit. If the internal temperature continues to fall below 40 degrees Fahrenheit, the second element of HR1 is activated. Overheat protection prevents application of heater power when temperatures exceed 80 degrees Fahrenheit. Heater operation is disabled if facility ac input power loss necessitates operation of the UPS.

3.1.3.1.5 Faraday Box A3. Figure 3.1.7 illustrates the parts/assembly locations associated with the Faraday box, which provides the signal and power interfaces for DCP operations. Up to 16 fiberoptic modules (A3A1 through A16, one per sensor) may be located on top of the box. These modules provide digital/optical data conversions necessary for DCP communication with individual sensor assemblies. Each fiberoptic module possesses a distinct transmit and receive channel. The rf output connection to the externally mounted antenna assembly is located on top of the box. The left side of the shielded box assembly contains two DB-25 connectors (J5 and J6) which carry sensor power lines while the five remaining connectors (J1 through J4 and J9) are EMI filter equipped and route ac power throughout the DCP. Two ac distribution panels (A17 and A18), with surge suppression capability, are located inside the Faraday box and provide the necessary ac interconnections between the input facility power, the DCP, and its sensors.

3.1.3.2 AC Junction Box. The ac junction box (Figure 3.1.8), located external to the DCP equipment cabinets, provides the main control point for the facility ac site power. The box consists of a standard circuit breaker box which contains one dual (2-phase) 40-ampere main circuit breaker, two 30-ampere circuit breakers, two 15-ampere circuit breakers, and a 15-ampere ground fault interrupter (GFI) circuit breaker. The four secondary breakers provide power to the clearance lights, primary DCP, auxiliary DCP, and utility GFI outlet located on the side of the box. The GFI outlet provides additional safety for the technician when working on the equipment and should be used to supply power to any test equipment or support equipment used at the sensor pad. For the power expanded DCP (Figure 3.1.9), a dual 30-ampere circuit breaker replaces one 30-ampere circuit breaker and the 40-ampere main circuit breaker.

3.1.3.3 RF Antenna. The rf antenna enables ACU/DCP communications and operates on the ASOS rf frequencies (410.075 or 410.950 MHZ). The antenna itself is usually an omnidirectional antenna, but it is mounted onto its mast in such a manner as to provide some directional gain (in the direction of the ACU antenna). At certain sites where RFI was experienced, yagi antennas are used at one or both ends of the link. A yagi can only be used at the ACU if all DCP's are illuminated within the yagi's 10-degree beamwidth. A seven-element yagi, PN 62828-90413-2, provides 10 dB gain over the 406 - 420 MHz band and has a front:back ratio of 14 dB. Additionally, at sites where cochannel interference is particularly troublesome, five watt attenuators of 3 dB, 6 dB, 10 dB, 20 dB, or 30 dB (PN 62828-90424-2, -3, -4, -5 and -6, respectively) may be inserted in the antenna line(s) to reduce transmit power into the antennas.

3.1.4 DCP CONFIGURATIONS

There are seven possible configurations for the DCP, which are described below. In addition, there is a special application version of the DCP, which contains three pressure sensors.

-10	Class II DCP with an uninterruptible power supply (UPS) built by SOLA	
-20	Standard Class I DCP (small cabinet)	\$
-30	Class II DCP with an enclosure built by Electrorack, an extension on the Faraday box, and an UPS built by SOLA	
-40	Class I DCP with an enclosure built by Electrorack, an extension on the Faraday box, and the old style backplate	
-50	Class II DCP with the new backplate, an UPS by Deltec, and the new harness	
-60	Class I DCP with the new backplate, and the new harness	
-70	Class I DCP with an UPS built by Deltec	

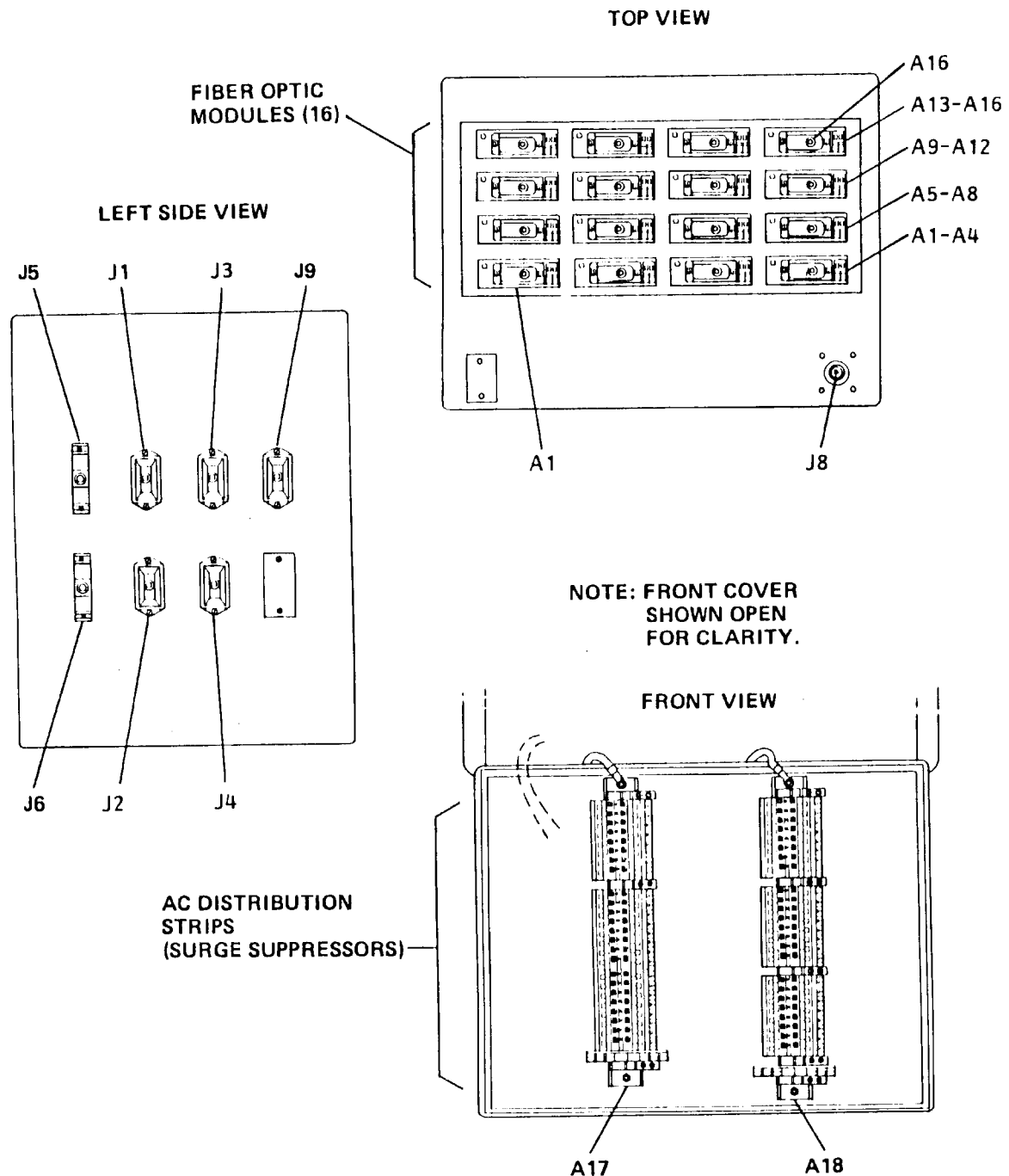


Figure 3.1.7. Faraday Box - Locational View

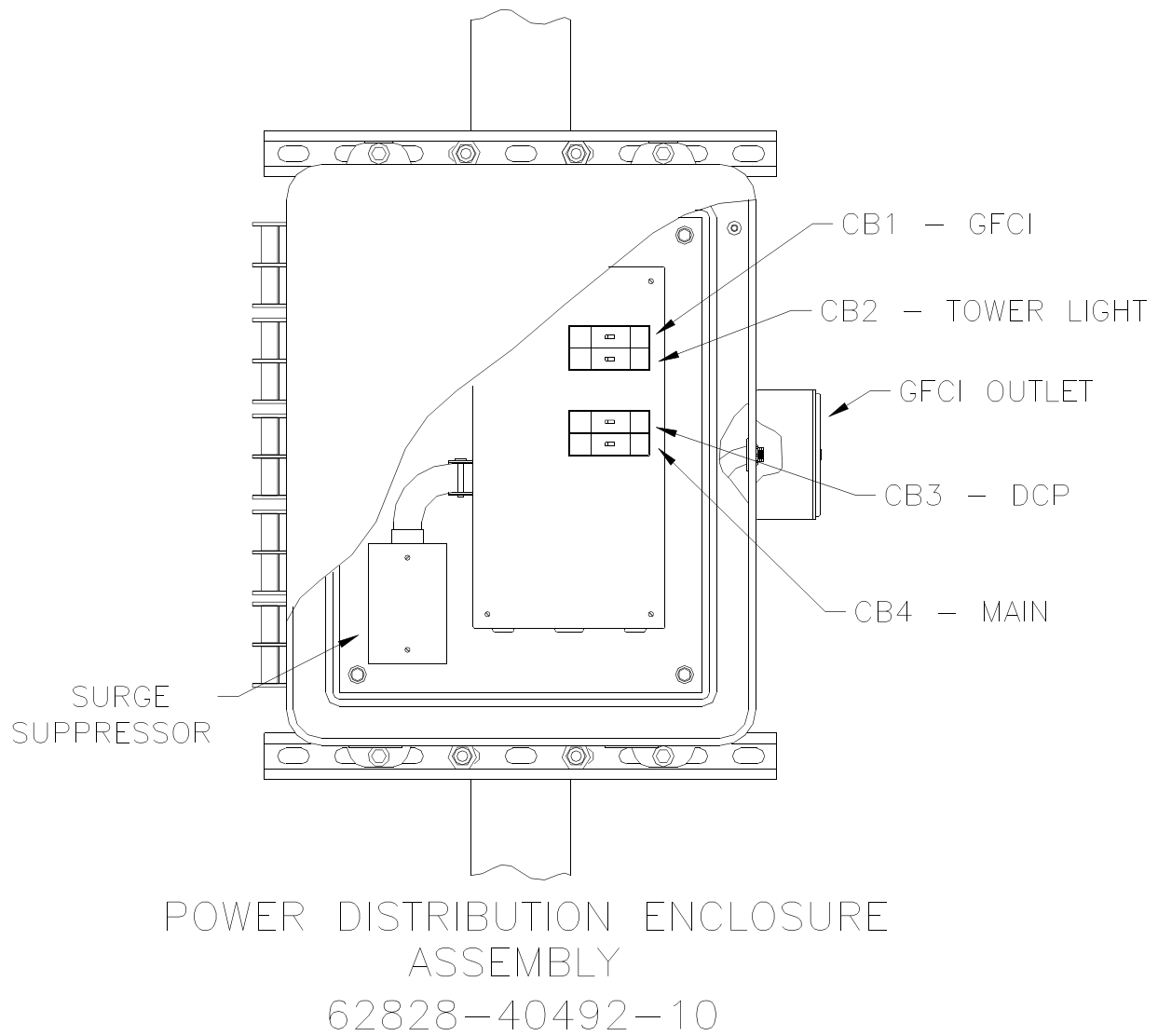


Figure 3.1.8. Typical AC Junction Box (Sheet 1 of 2)

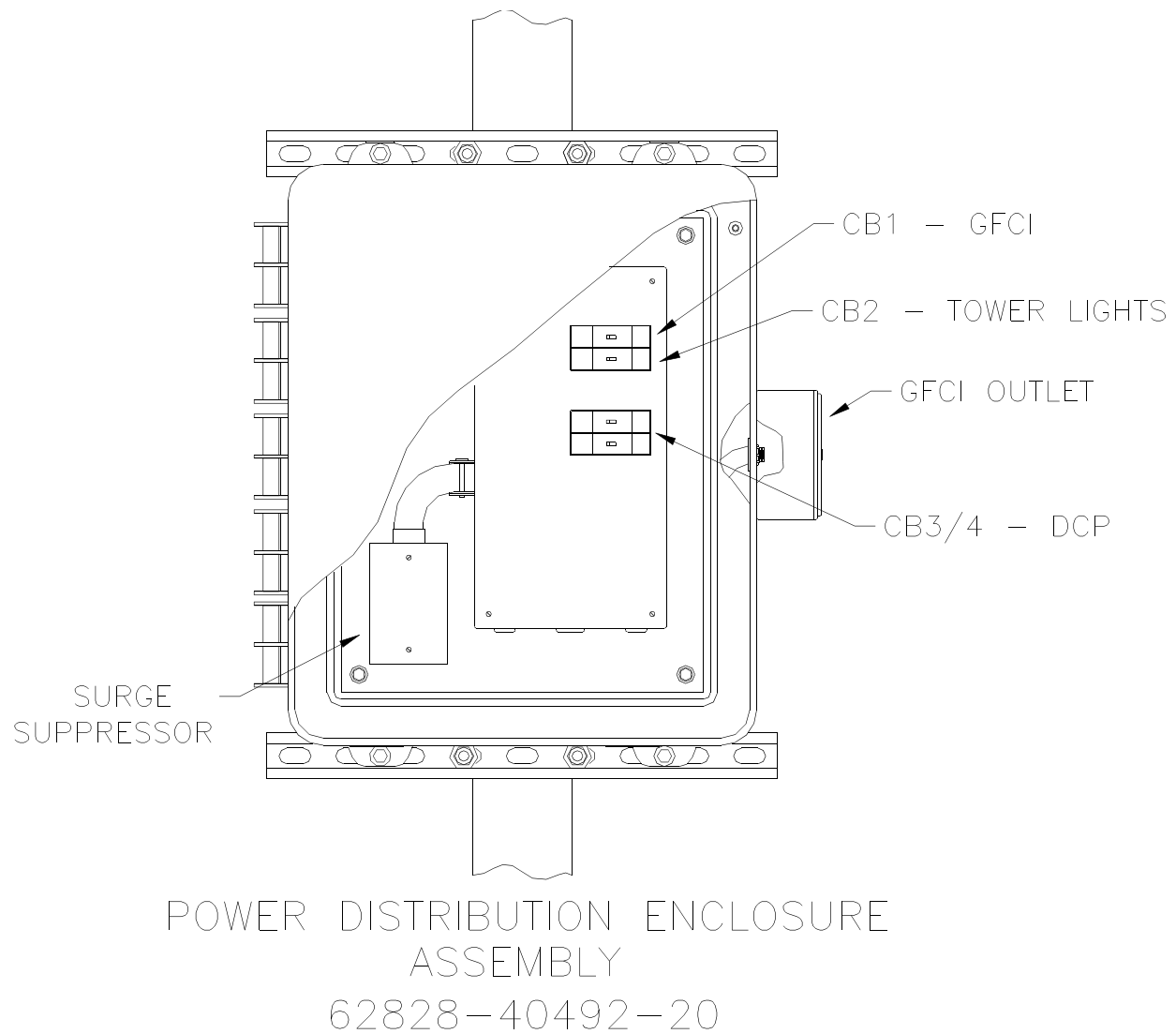
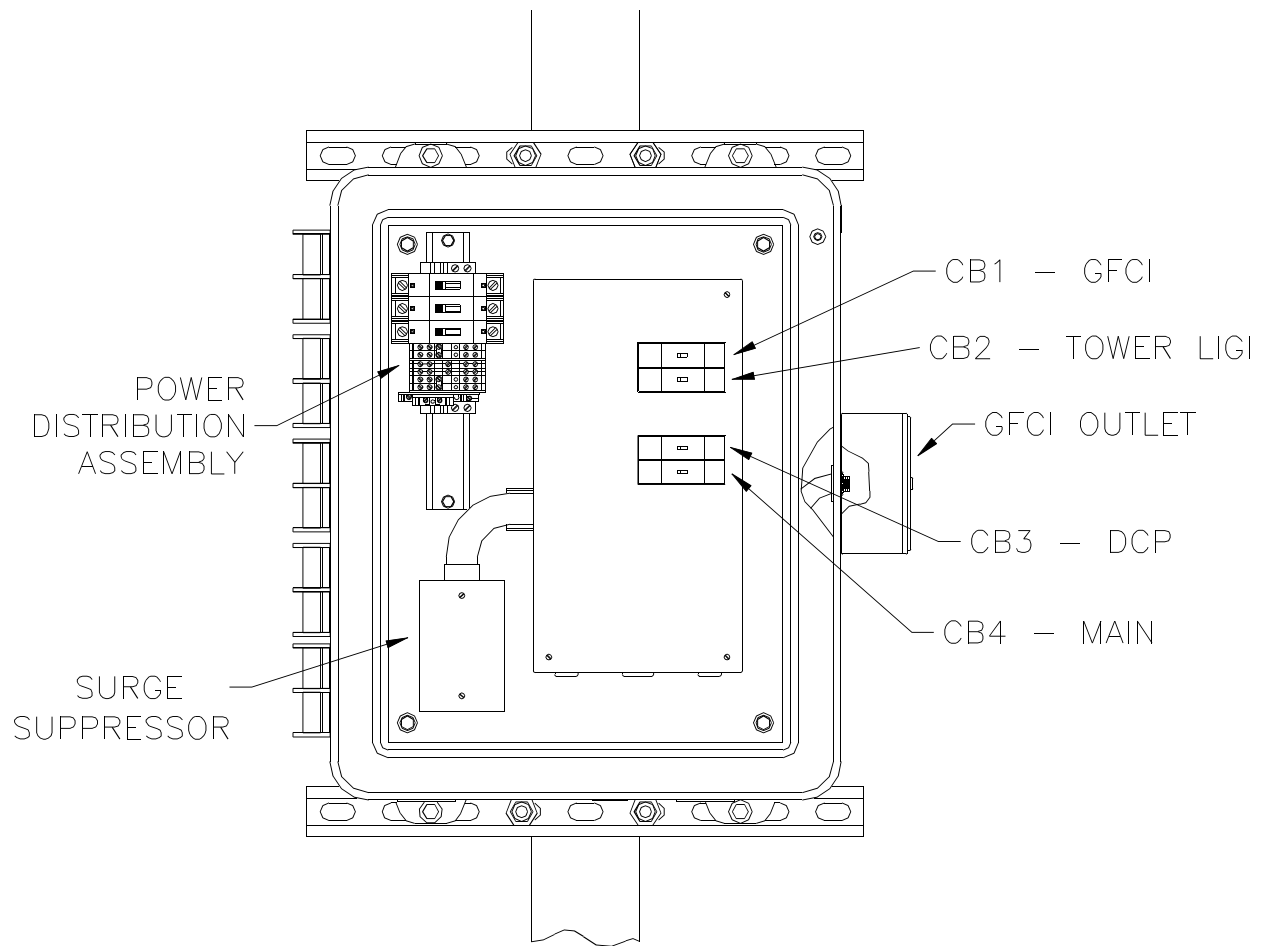


Figure 3.1.8. Typical AC Junction Box (Sheet 2)



POWER DISTRIBUTION ENCLOSURE
ASSEMBLY

62828-40492-30

Figure 3.1.9. Power Expansion DCP AC Junction Box - Locational View